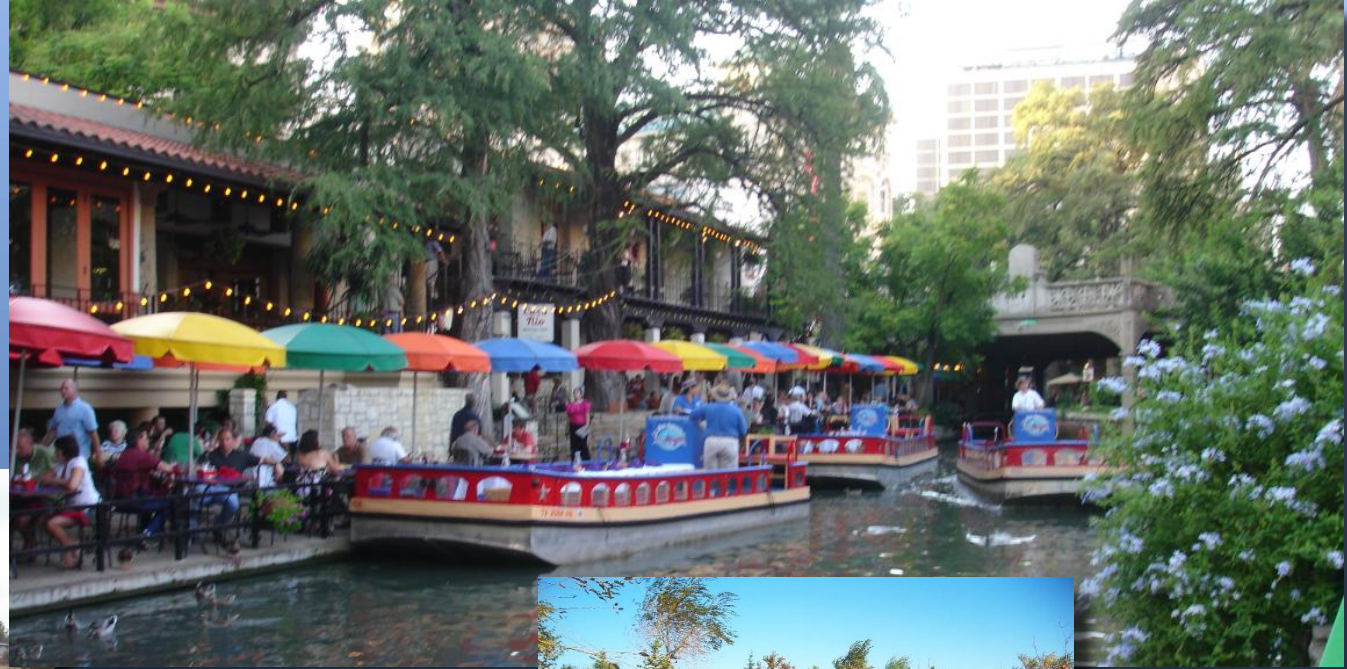


STORM WATER PONDS



What are we going to cover?

The Objectives

- Storm Water
- Storm Water Laws
- Types of Ponds
- Pond Design
- Pond Maintenance
- Pond Misconceptions
- Pond Realities
- Examples



General Firm Information

- Established 1960
- Offices in Minot-West Fargo, ND
Fergus Falls-Wadena, MN
- 100% Employee-Owned
- Disciplines:
 - Municipal Engineering
 - Transportation Engineering
 - Water Resources
 - Environmental
 - Land & Site Development
 - Land Acquisition
 - Surveying



Impacts of Storm Water

➤ Flooding

- Development
- Drainage Patterns
- Emergency Measures

➤ Debris

- Large Flows
- Trees/Branches
- Buildings
- Stone
- Litter

➤ Sedimentation

- Low flows
- High flows
- Deposition
- Pollutants



Storm Water Ponds

Impacts of Storm Water



Storm Water Ponds

Why we care?

- The Law
 - Federal
 - State
 - Local
- Environment
 - Preservation
 - Mitigation
 - Impacts
 - Downstream
- Quality of Life
 - Environment
 - Aesthetics
 - Use



Storm Water Ponds

Why we care?

- All of the above...plus....



OUR FUTURE...



Storm Water Ponds

Types of Ponds

Types of Ponds

➤ Retention

- a.k.a. stormwater ponds, wet retention ponds, wet extended detention ponds

➤ Detention

- a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds

➤ Infiltration

- a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds
- Depends on permeability of soil
- Bioretention
- Raingardens



Storm Water Ponds

Types of Ponds

ALL ABOUT...

TIME

Detention Basin Overhead Profile

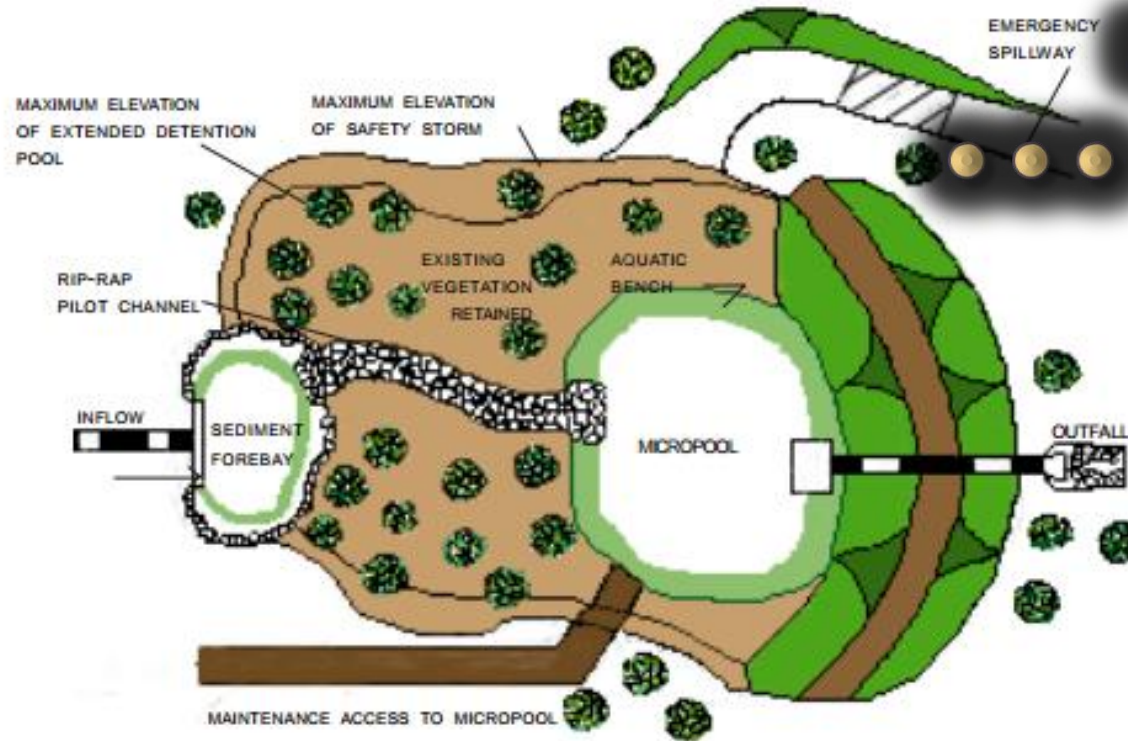


Diagram courtesy of Maryland BMP Manual

What's the Difference?

At times, the terms detention and retention seem to be used interchangeably - both are designed to capture and store runoff and delay its release to a water body in design. However, there is a difference in purpose.

Retention is defined as "maintaining possession of; holding in a particular place"; detention refers to delaying an action. For stormwater objectives, this refers to the amount of time water is left to stand in the basin.

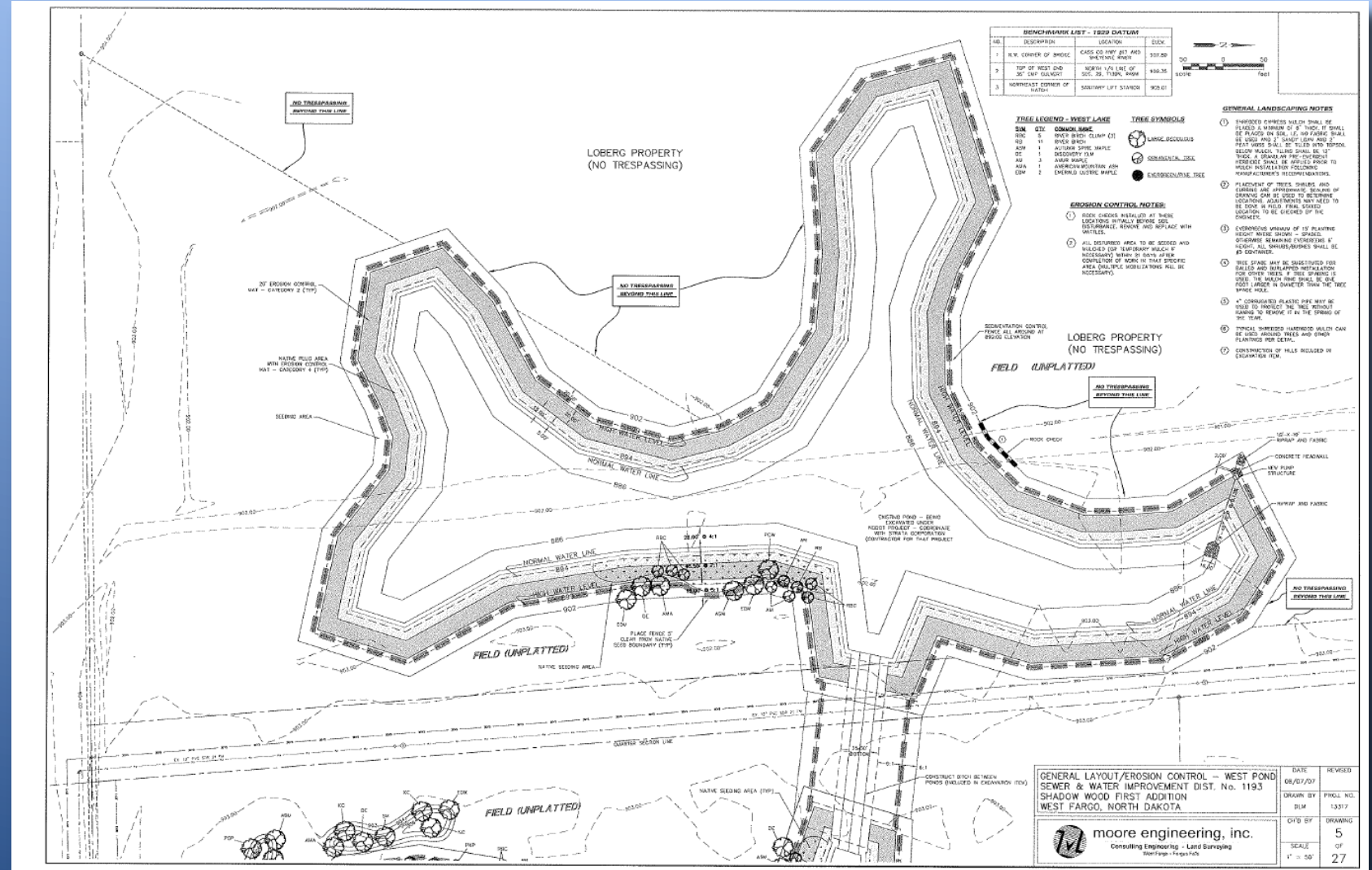
Detention ponds, whose primary function is to delay the release of runoff to streams, are designed for the eventual release of water. Retention basins are designed to allow sediment and pollutants to settle out of the water after it is captured through use of a permanent pool. Additional water received from a storm remains in the basin until it infiltrates into the ground or it reaches a depth that flows into a pipe or overflow structure. As it infiltrates, the water is filtered through the soil for removal of pollutants.

Pond Design and Maintenance

Pond Design

➤ Questions

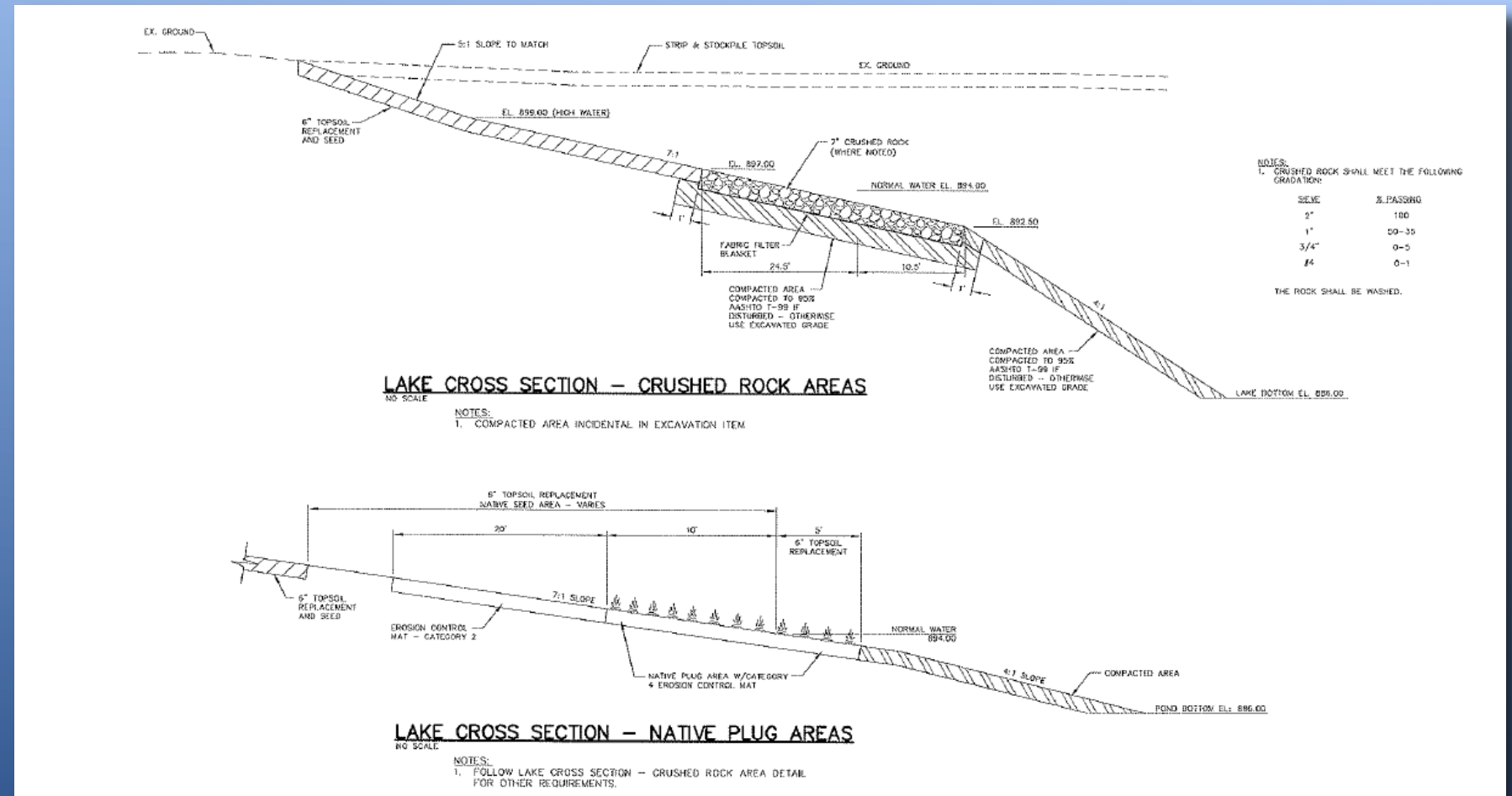
- Who?
 - Involvement
- What?
 - Purpose
- When?
 - Event
- Where?
- Why?
 - Purpose
 - Wildlife
- How?
 - Parameters
 - Economics
 - Space



Pond Design

➤ How????

- Water Level
- Event Frequency
- Bounce
- Outlets
- Inlets
- Armoring
- Aesthetics
- Slopes
- Drainage
- Erosion Control



Pond Design - Detention

➤ Critical Criteria

- Slopes
- Channel
- Mowability
- Blending
- Storm Sewer
 - Freezing



Storm Water Ponds

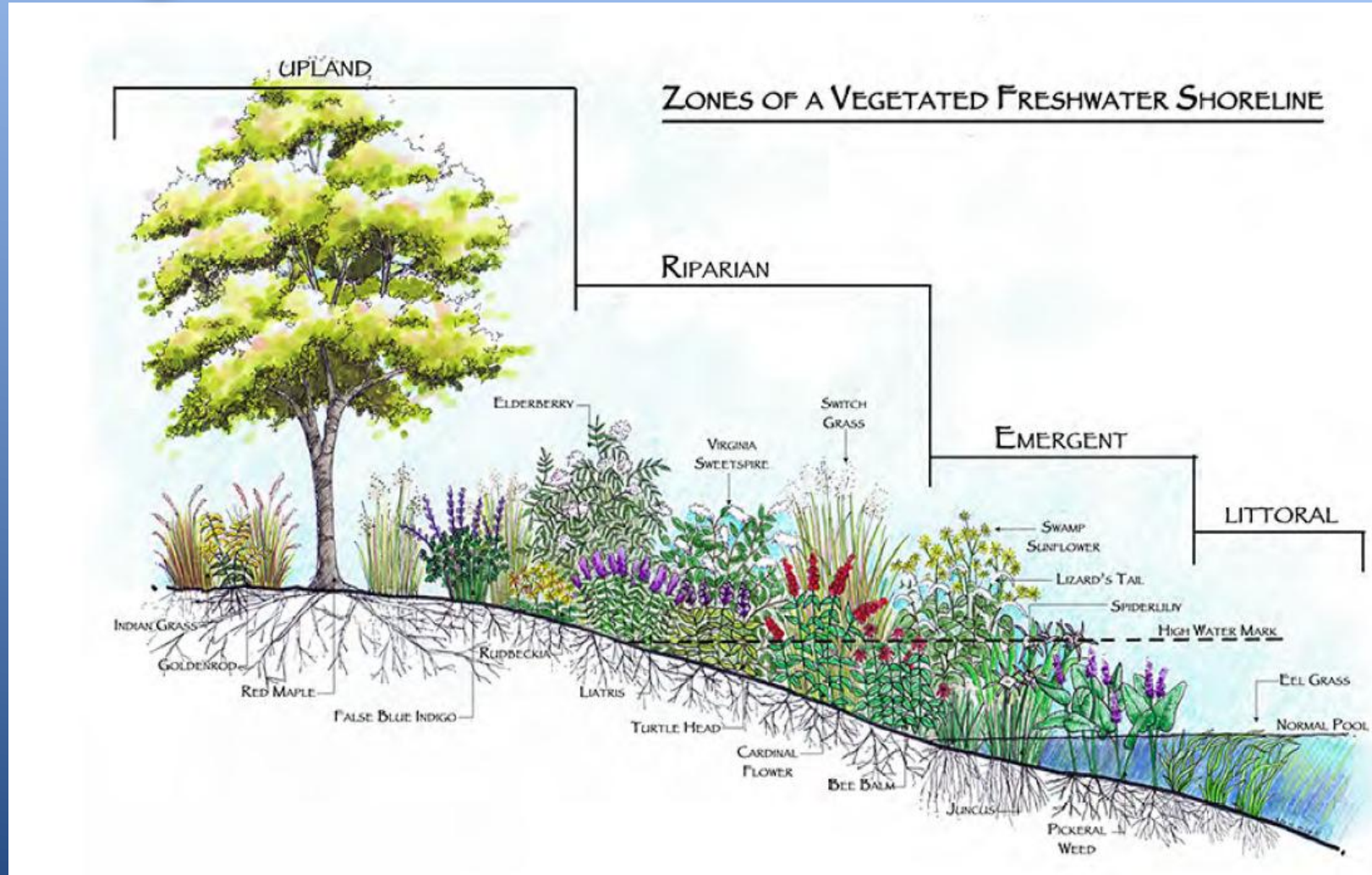
Pond Design - Retention



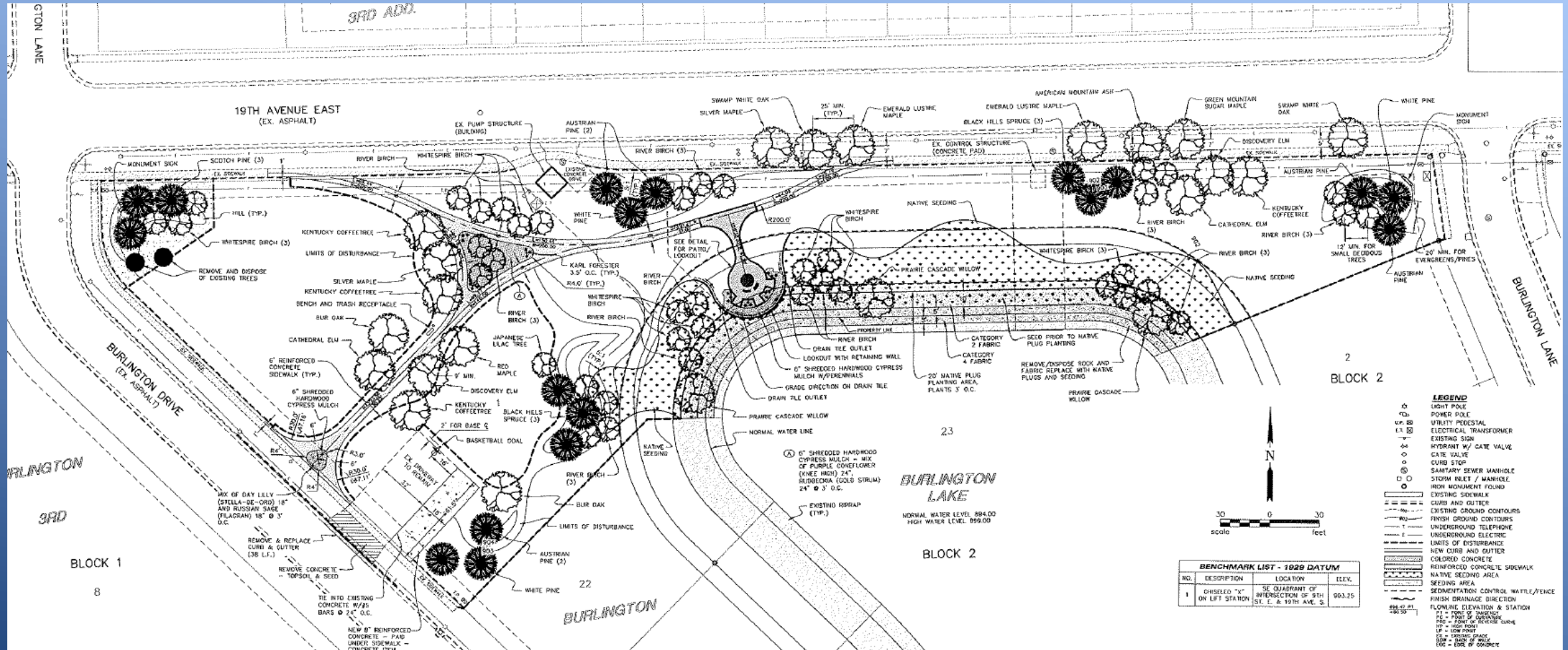
➤ Critical Criteria

- Depth
- Armoring/Vegetation
- Intent
- Water Quality
- Outfalls/Pumping

Pond Design

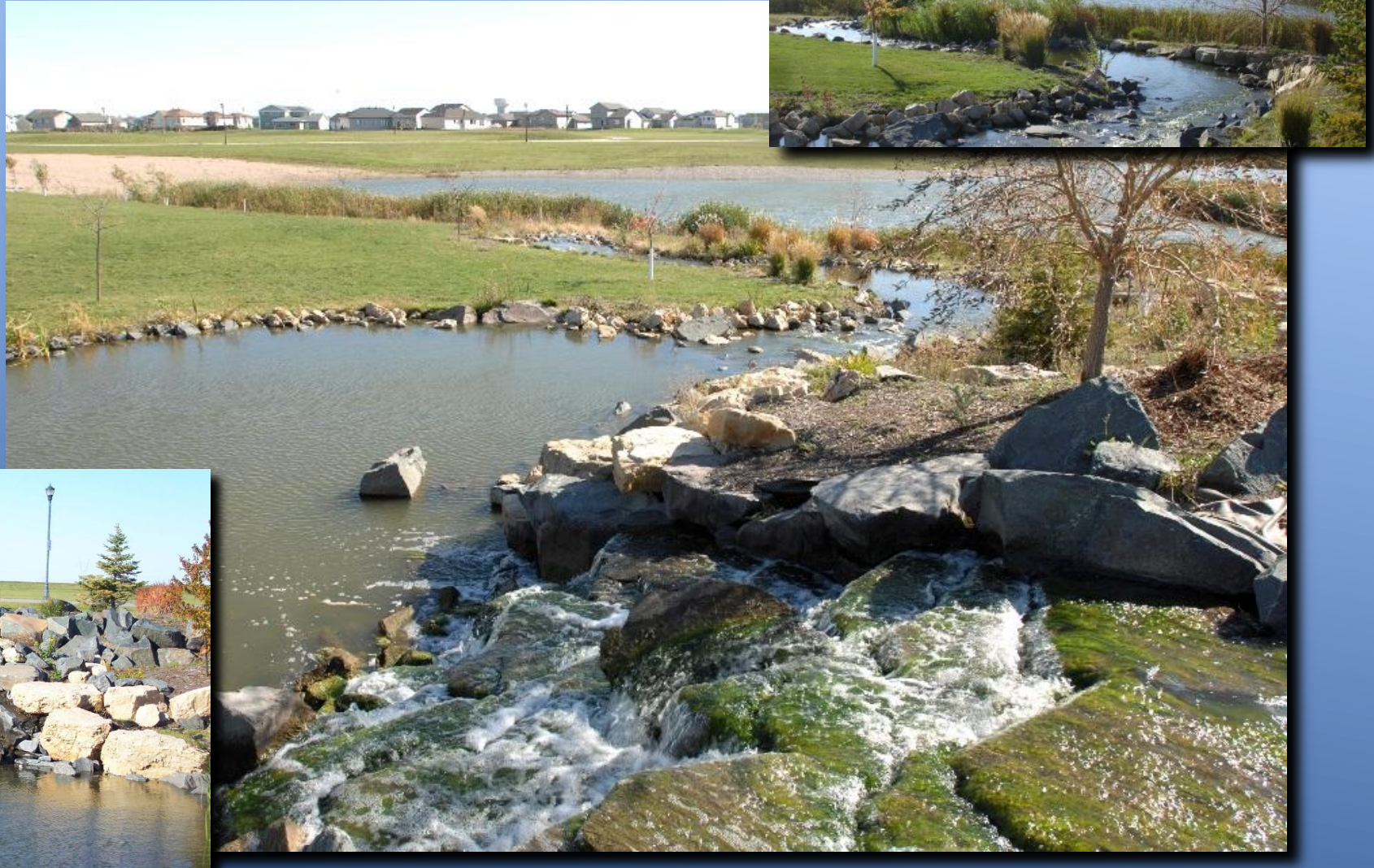


Pond Design



Amenities

- Amenities
 - Waterfalls
 - Beaches
 - Docks
 - Paths
 - Parks



Amenities



Amenities



Pond Maintenance

➤ Questions

- Who?
 - Responsibility
- What?
 - Intent of Facility
- When?
 - Frequency – How often
- Where?
- Why?
 - Prevention
 - Mitigation
- How?
 - Funding
 - Personnel
 - Task



Storm Water Ponds

Pond Maintenance

➤ Items

- Mowing
- Weed Control
- Dredging
- Hard Armor Areas
- Fountains
 - Permanent
 - Temporary
- Outlet Structures
- Pump Structures
- Water Issues
- Other Amenities



What are we doing?

What are we envisioning?



What are we envisioning?



What are we envisioning?



What are we envisioning?



What are we envisioning?



What are we envisioning?



What are we encouraging?



Does this look right?



Could we have done more?



Don't think this is quite right...



Is this a design issue?



Pond Myths, Misconceptions, and Realities

Misconceptions

- They are a danger to...



What is your comfort zone???



...but ...
understand risk

Misconceptions

- They will be a haven for those EVIL.....

Mosquitoes



Storm Water Ponds

Realities

Mosquito Control

- Proper Pond Design
 - Eliminate Shallow Water
 - 6" or less to proliferate mosquitoes
 - 12" or deeper better
 - Reduce large shallow areas
 - Open Water
 - Improve Water Quality
 - Use of plants
 - Dry Ponds can be worse than Wet Ponds
 - Remove water in 72 hours

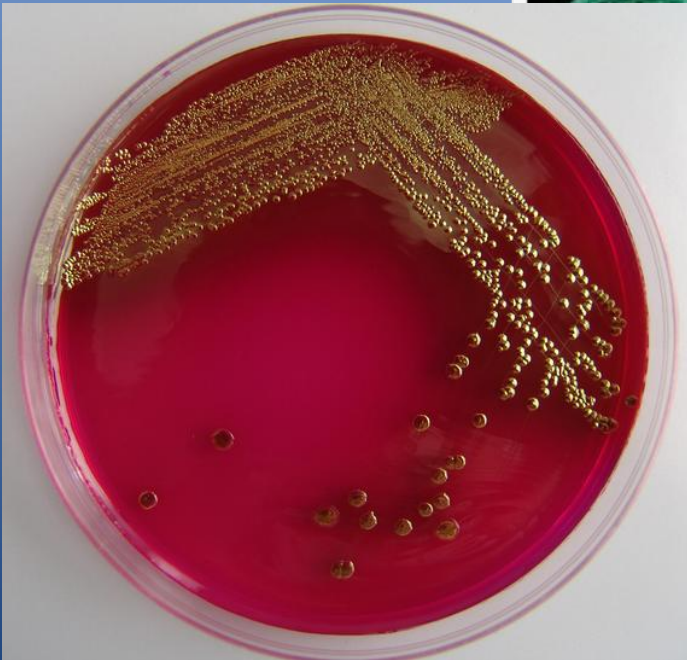


Storm Water Ponds

Misconceptions

- Ponds are full of....

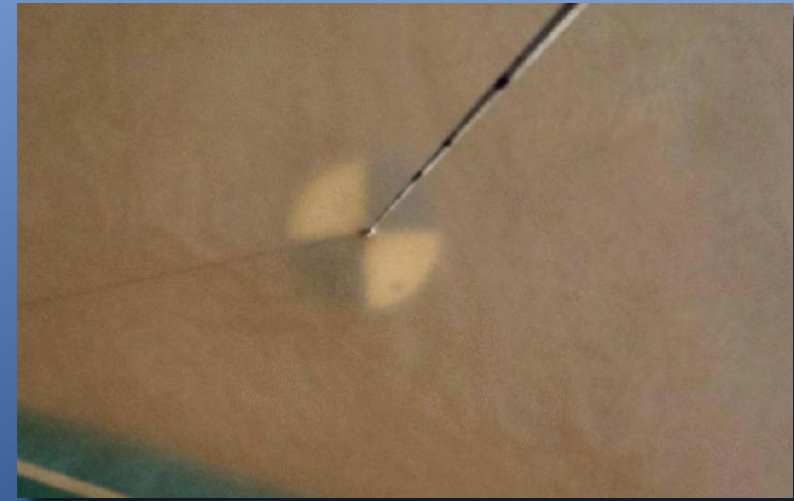
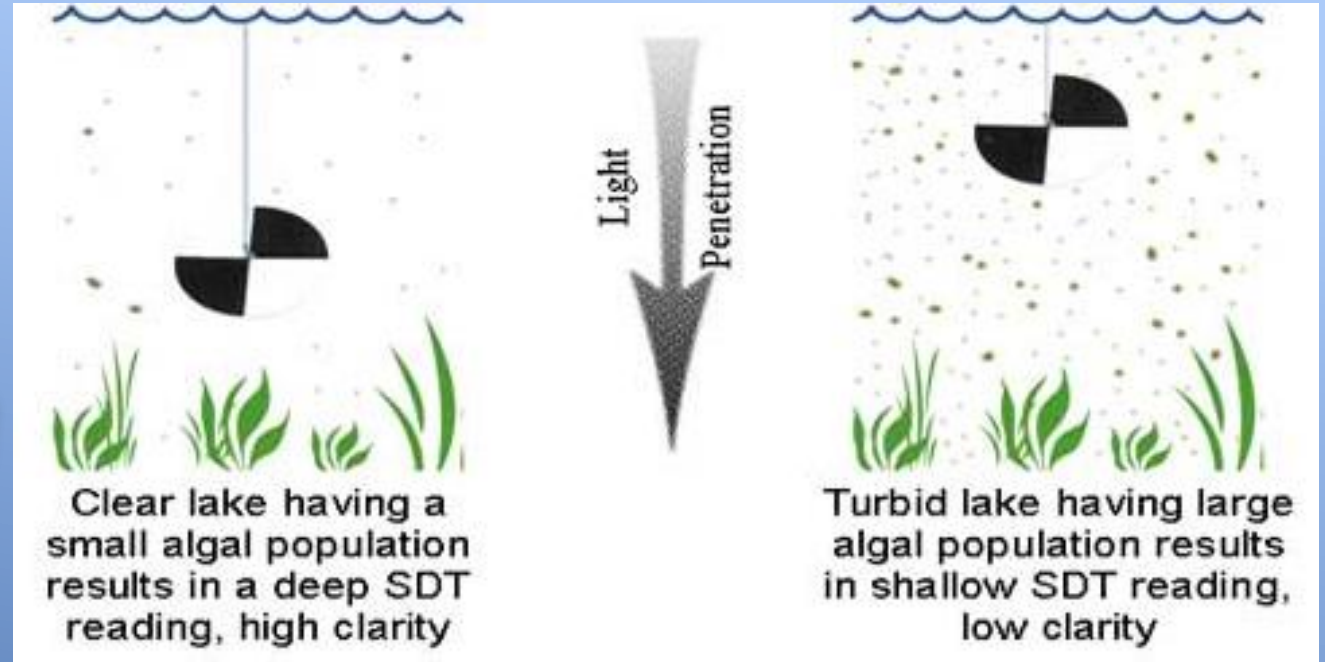
Bacteria



Realities

Bacteria and Water Quality

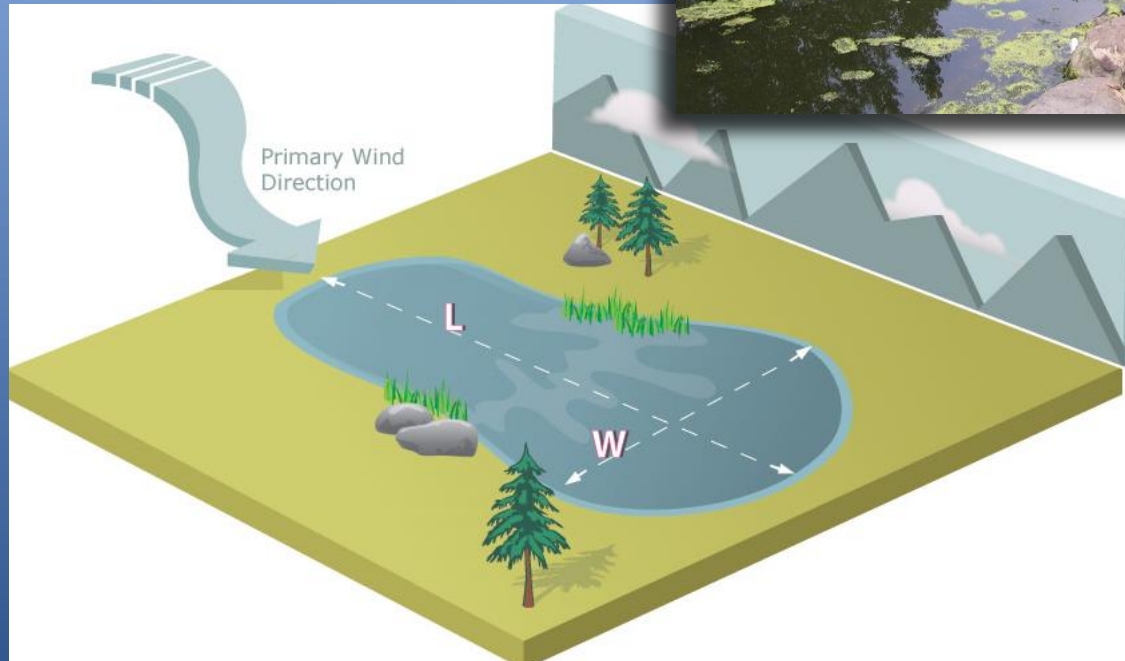
- Clarity – Secchi Disk
- E-coli
- pH
- Total Dissolved Solids
- Nitrogen/Phosphorus
- Dissolved Oxygen
- West Fargo Experience
 - Similar to Lake



Storm Water Ponds

Realities - Retention *Algae*

- Caused by
 - Water Temperature
 - Depth
 - Pollutants
- Treatment
 - Algacide
 - Aeration
 - Water Turnover
 - Fetch



Realities

- Fencing
 - Flash Flooding
 - Limited space



Storm Water Ponds

Realities

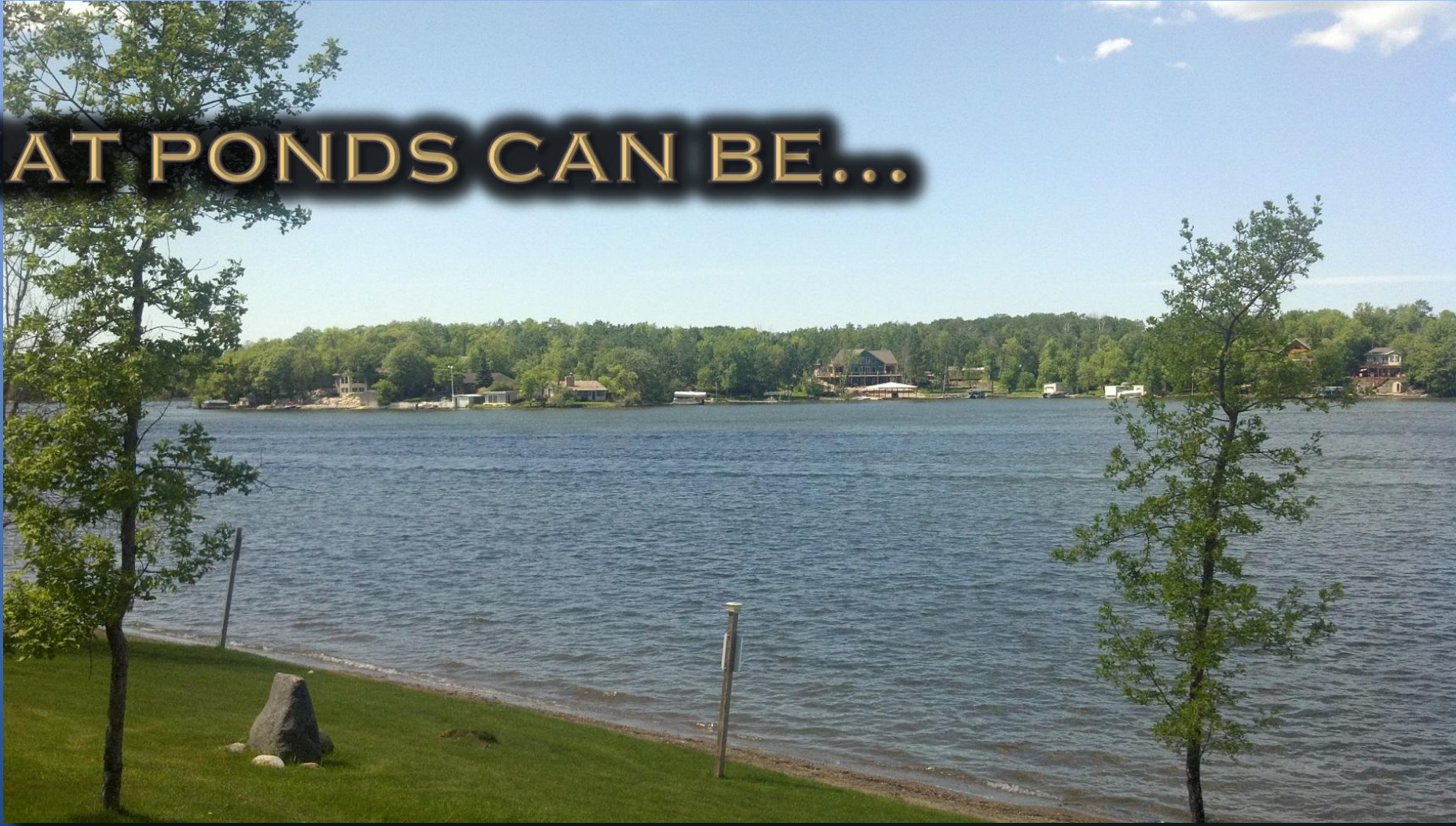
➤ Fencing



Examples

Examples

WHAT PONDS CAN BE...



Examples



Examples



Examples



Storm Water Ponds

Examples



Examples



Storm Water Ponds

Examples

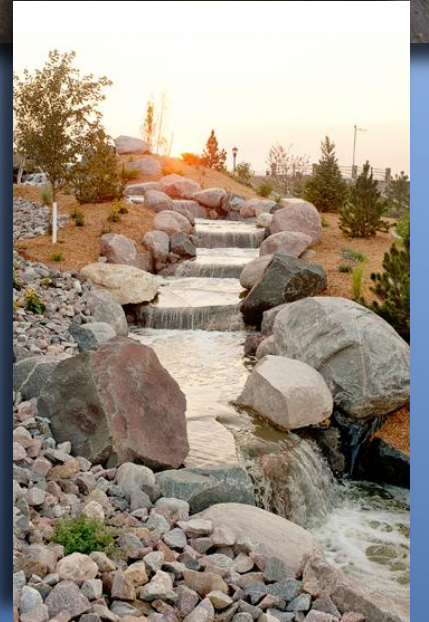


Examples

- ✓ Open Areas and Large Park
- ✓ Wet Ponds
- ✓ Lacking
 - ✓ Trees
 - ✓ Character



Examples



Making Things Better



Making Things Better



Recreation



Recreation



Examples



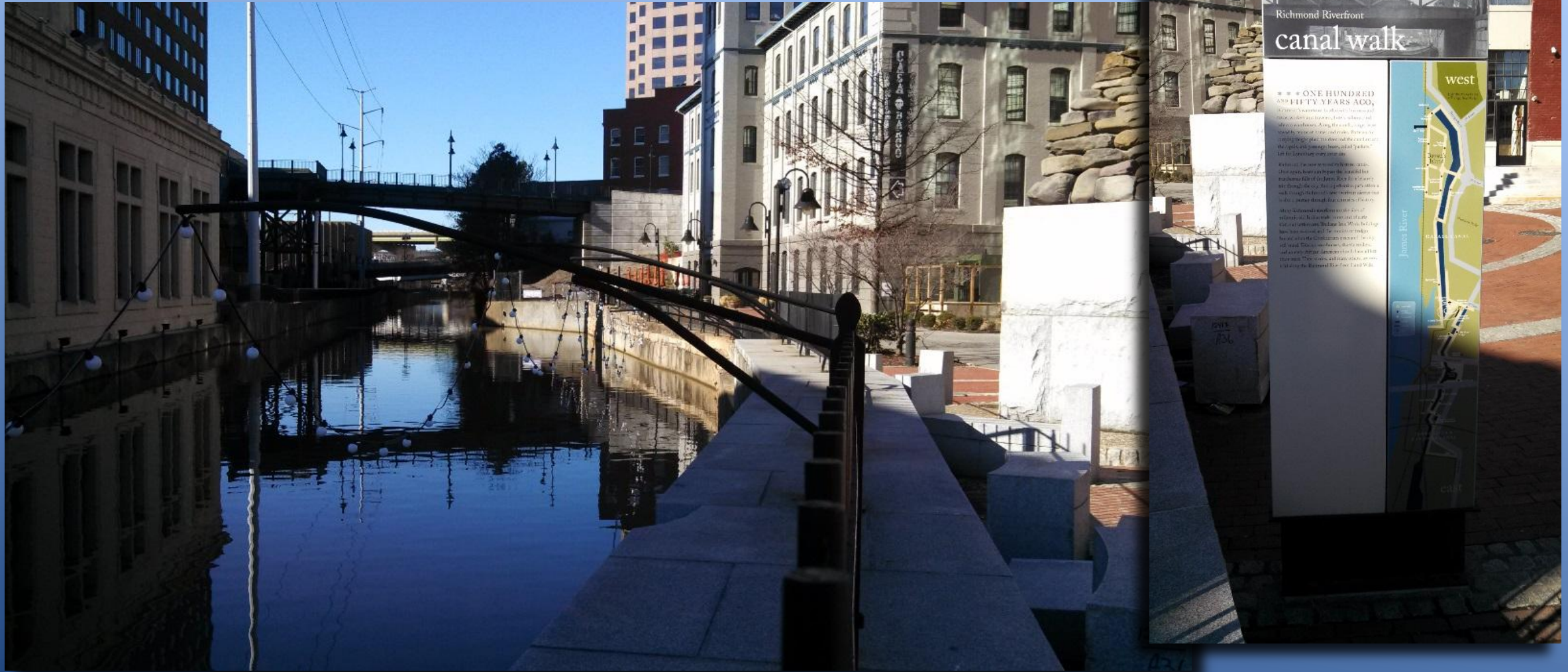
Examples



Examples

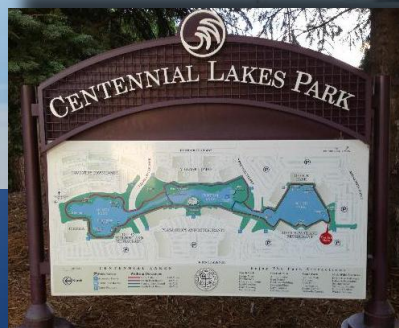
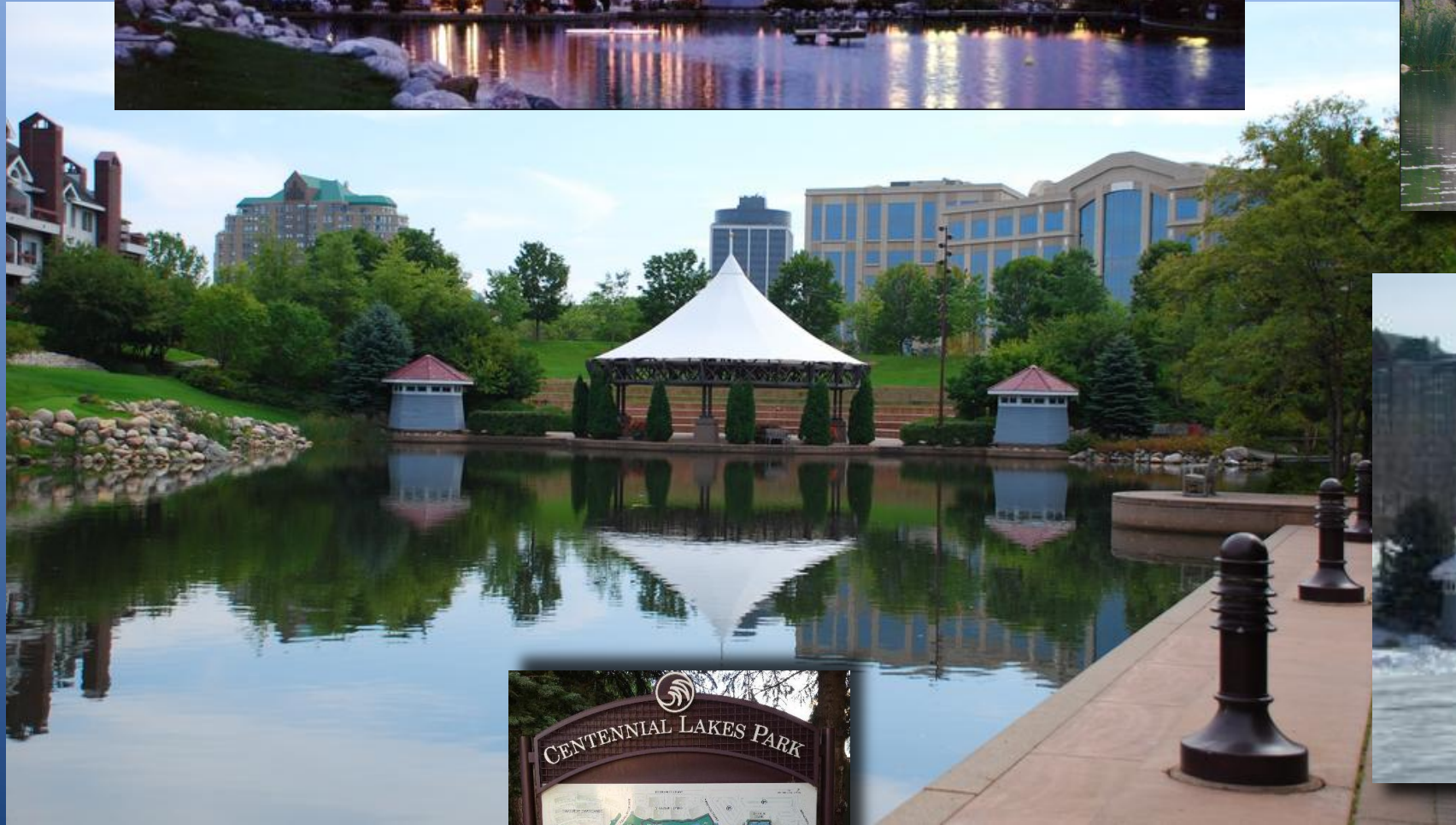


Examples



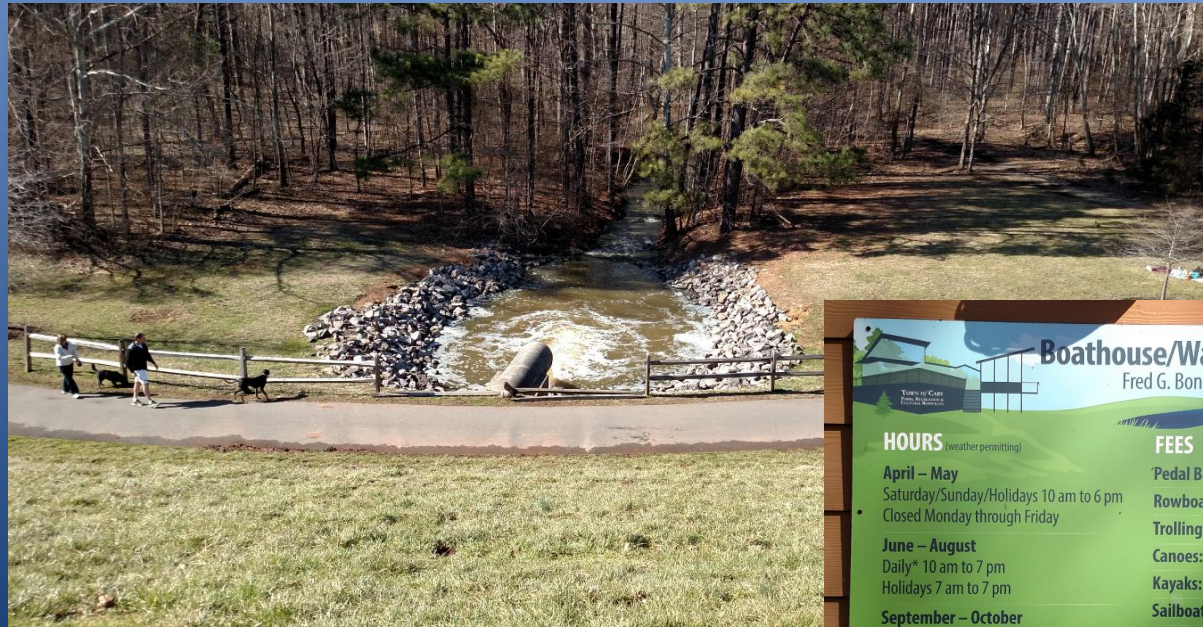
Examples





Examples







Boathouse/Waterfront

Fred G. Bond Metro Park

HOURS <small>(weather permitting)</small>	FEES
April – May Saturday/Sunday/Holidays 10 am to 6 pm Closed Monday through Friday	Pedal Boats: \$7 per half hour Rowboats: \$6 per hour Trolling motors: \$9 per usage
June – August Daily* 10 am to 7 pm Holidays 7 am to 7 pm	Canoes: \$6 per hour Kayaks: \$6 per hour Sailboats: \$11 per hour
September – October Saturday/Sunday/Holidays 10 am to 6 pm Closed Monday through Friday	Private Launch: \$4 per boat Season Launch Pass: \$30 per boat
Closed November – March <small>* Closed weekdays in August with the start of the Wake County traditional school year</small>	(919) 469-4100



Storm Water Ponds



QUESTIONS ...



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